Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Electronic supplementary information

Superior adsorption of pharmaceuticals molecules by highly porous BN nanosheets

Dan Liu,[a] Weiwei Lei,*[a] Si Qin,[a] Karel D. Klika[b] and Ying Chen*[a]

[a] *Institute for Frontier Materials, Deakin University, Waurn Ponds, Victoria 3216, Australia*
[b] *Molecular Structure Analysis, German Cancer Research Center (DKFZ),*
Im Neuenheimer Feld 280, D-69009 Heidelberg, Germany

Experimental Section

Materials. Analytical grade tetracycline (**TC**), chlortetracycline hydrochloride (**CTC**), ciprofloxacin (**CIP**), and norfloxacin (**NOR**) were purchased from Sigma-Aldrich Co. and Fluka Co. Porous BNNSs were prepared by a dynamic templating approach.[30] In a typical run, 4 mmol (0.28 g) of boron trioxide (B_2O_3) and 20 mmol (1.95 g) of guanidine hydrochloride in a 1 : 5 molar ratio were mixed in 20 mL of methanol with rapid stirring to form a clear, colorless solution. After 24 h, a white, crystalline powder consisting of a complex between the B_2O_3 and guanidine had formed. The material was filtered off, placed in a quartz boat and heated to 1,100 °C at a rate of 10 °C min^{-1} for 2 h under a nitrogen–hydrogen (85 : 15, respectively) atmosphere to yield a white solid. Scanning electron microscopy (SEM) was conducted using a Carl Zeiss Supra 55 VP instrument while transmission electron microscopy (TEM) was conducted using a JEOL JEM-2100. UV–vis measurements were taken on a Cary 5000 spectrophotometer.

Adsorption experiments. Solutions of **TC**, **CTC**, **CIP**, and **NOR** at various concentrations were prepared by dissolving appropriate amounts of the compounds in deionized water. For the adsorption experiments, 2 mg of porous BNNSs was added with stirring to 10 mL of the aqueous solutions of the compounds at concentrations of 50 (**TC** and **CTC**) or 10 (**CIP** and **NOR**) mg L^{-1}. The adsorption kinetics were enabled by UV–vis spectrophotometry with measurements at the maximum absorption wavelength for each compound: **TC**, 368 nm; **CTC**, 275 nm; **CIP**, 270 nm; and **NOR**, 271 nm. For the recyclability test, the saturated sample will be directly burned it in air to remove the absorbed organics. Adsorption isotherms were obtained by varying the initial concentration of the compounds.

The pH was adjusted using either 0.1 M NaOH or 0.1 M HCl accordingly.

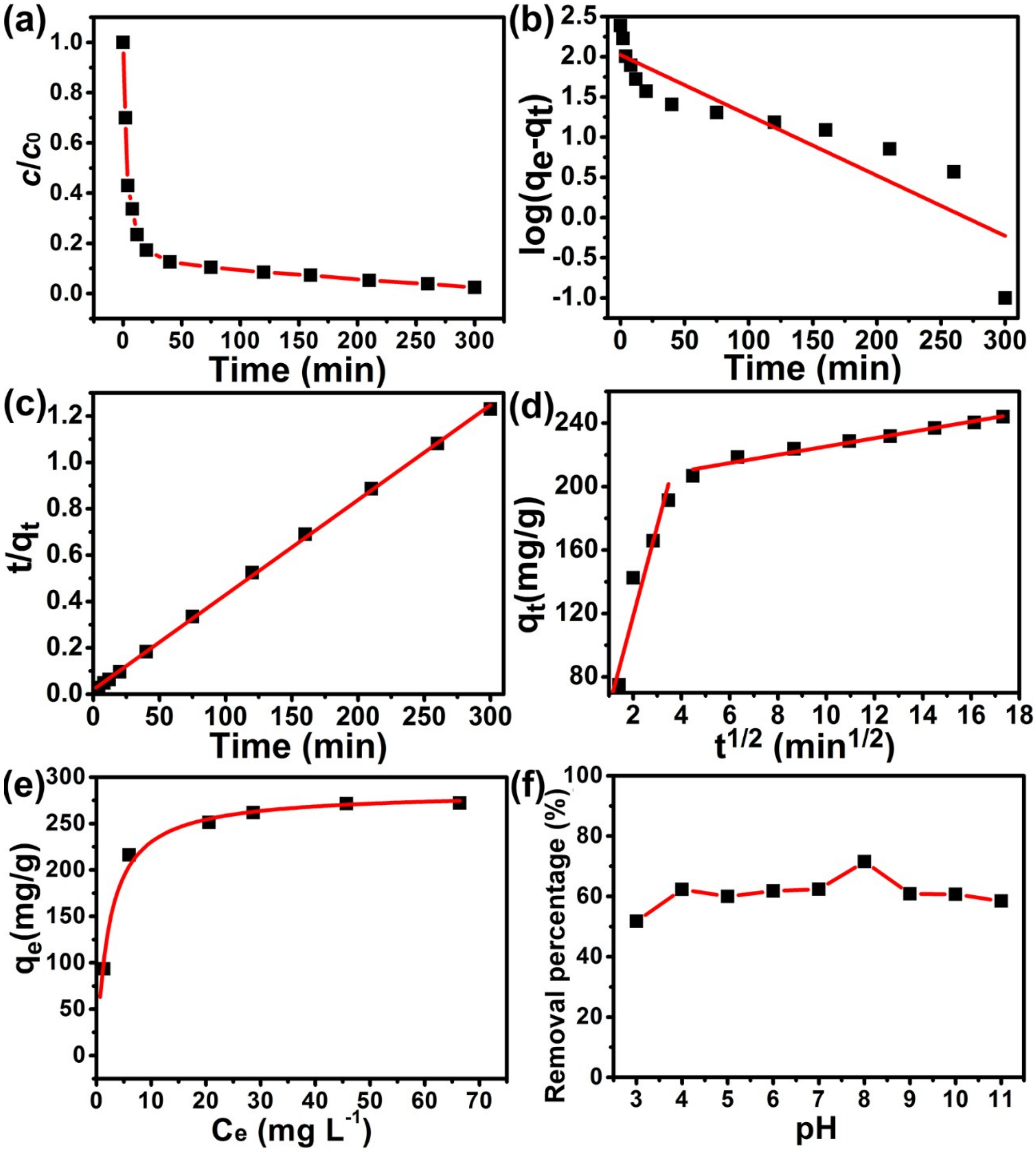

Fig. ESI1. Adsorption characterization of **TC** with porous BNNSs. (a) Adsorption uptake. Linear fitting of adsorption by (b) pseudo-first-order kinetic model, (c) pseudo-second-order kinetic model, and (d) intraparticle diffusion model. (e) Adsorption isotherm. (f) Variation of adsorption capacity with pH.

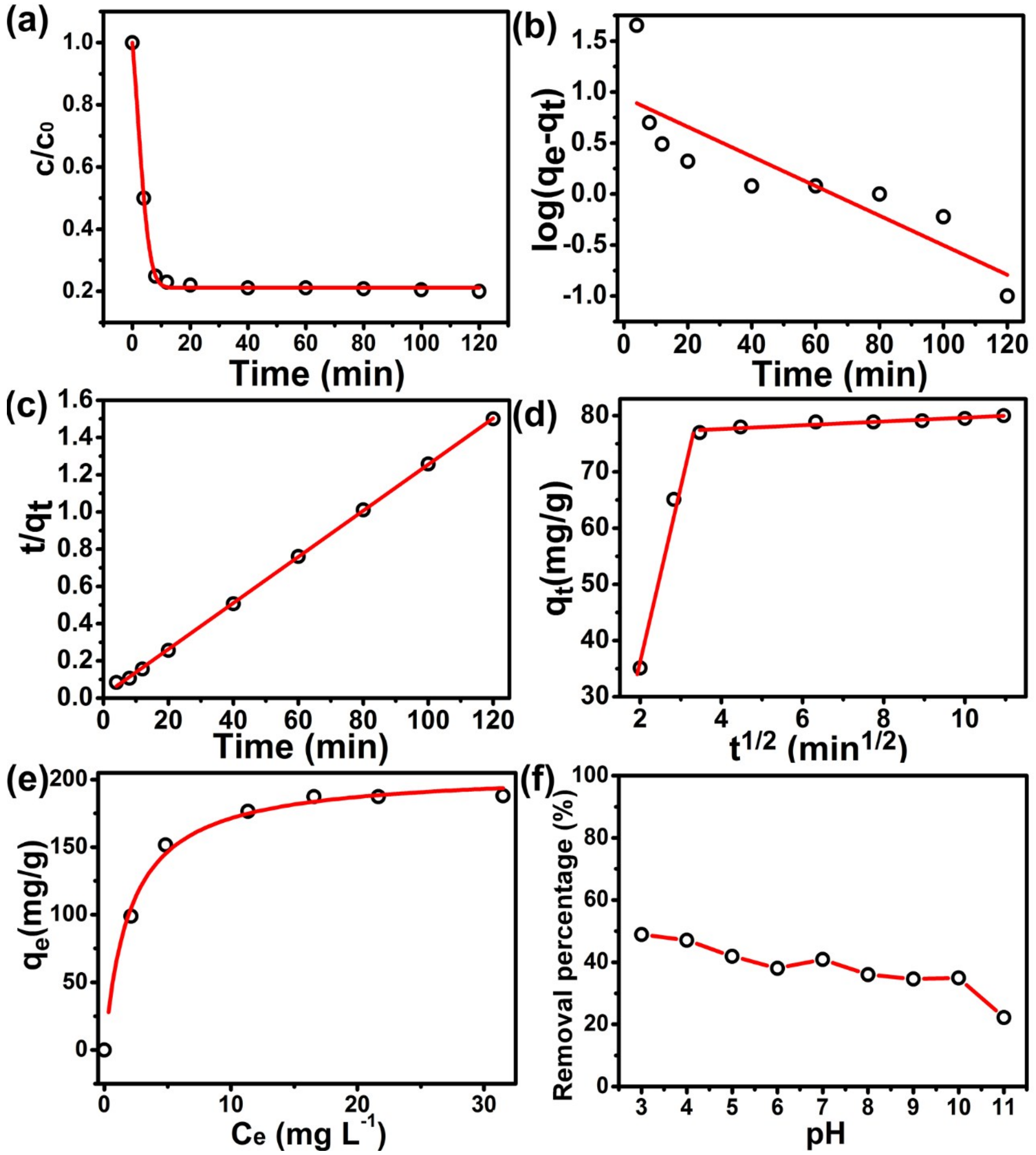

Fig. ESI2. Adsorption characterization of **CIP** with porous BNNSs. (a) Adsorption uptake. Linear fitting of adsorption by (b) pseudo-first-order kinetic model, (c) pseudo-second-order kinetic model, and (d) intraparticle diffusion model. (e) Adsorption isotherm. (f) Variation of adsorption capacity with pH.

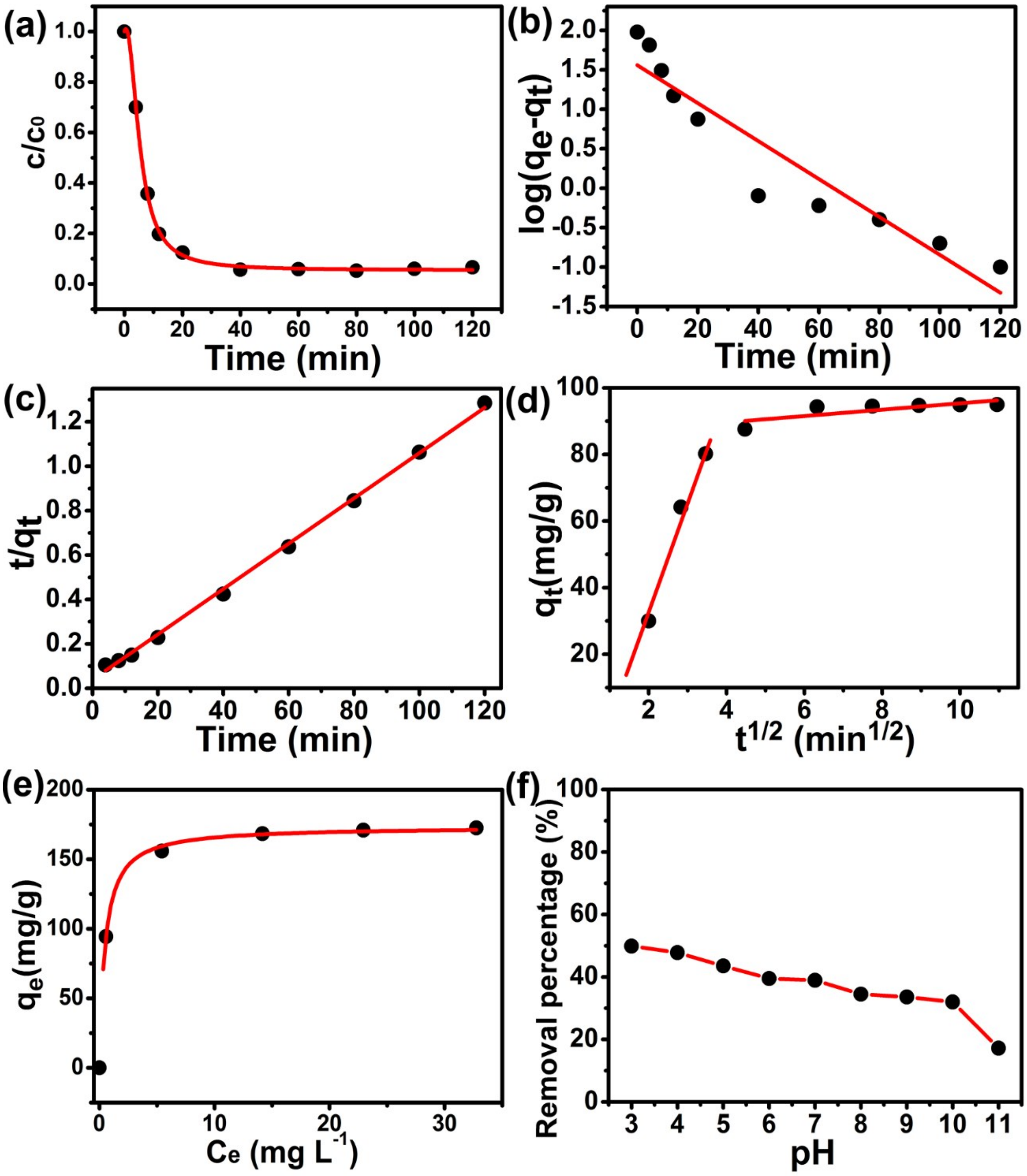

Fig. ESI3. Adsorption characterization of **NOR** with porous BNNSs. (a) Adsorption uptake. Linear fitting of adsorption by (b) pseudo-first-order kinetic model, (c) pseudo-second-order kinetic model, and (d) intraparticle diffusion model. (e) Adsorption isotherm. (f) Variation of adsorption capacity with pH.

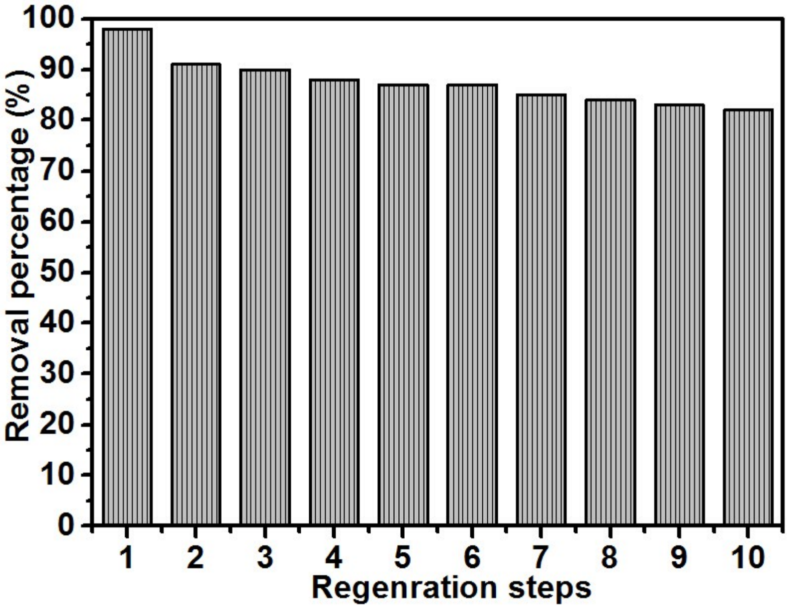

Fig. ESI4. Variation of the adsorption capacity of **CTC** by the porous BNNSs after successive regeneration steps.

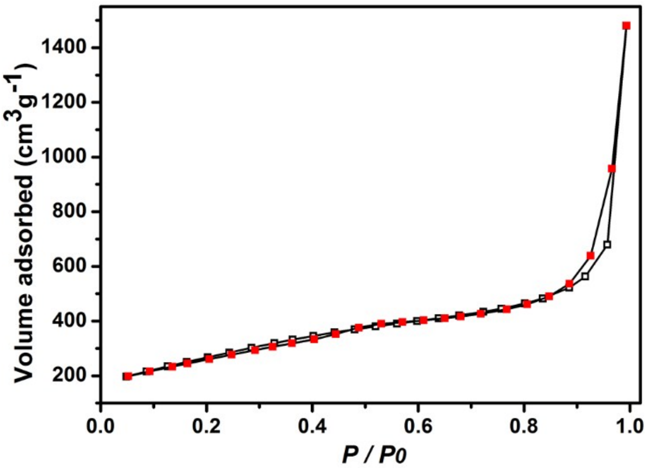

Fig. ESI5. Nitrogen adsorption–desorption isotherm of porous BN nanosheets after regeneration process.